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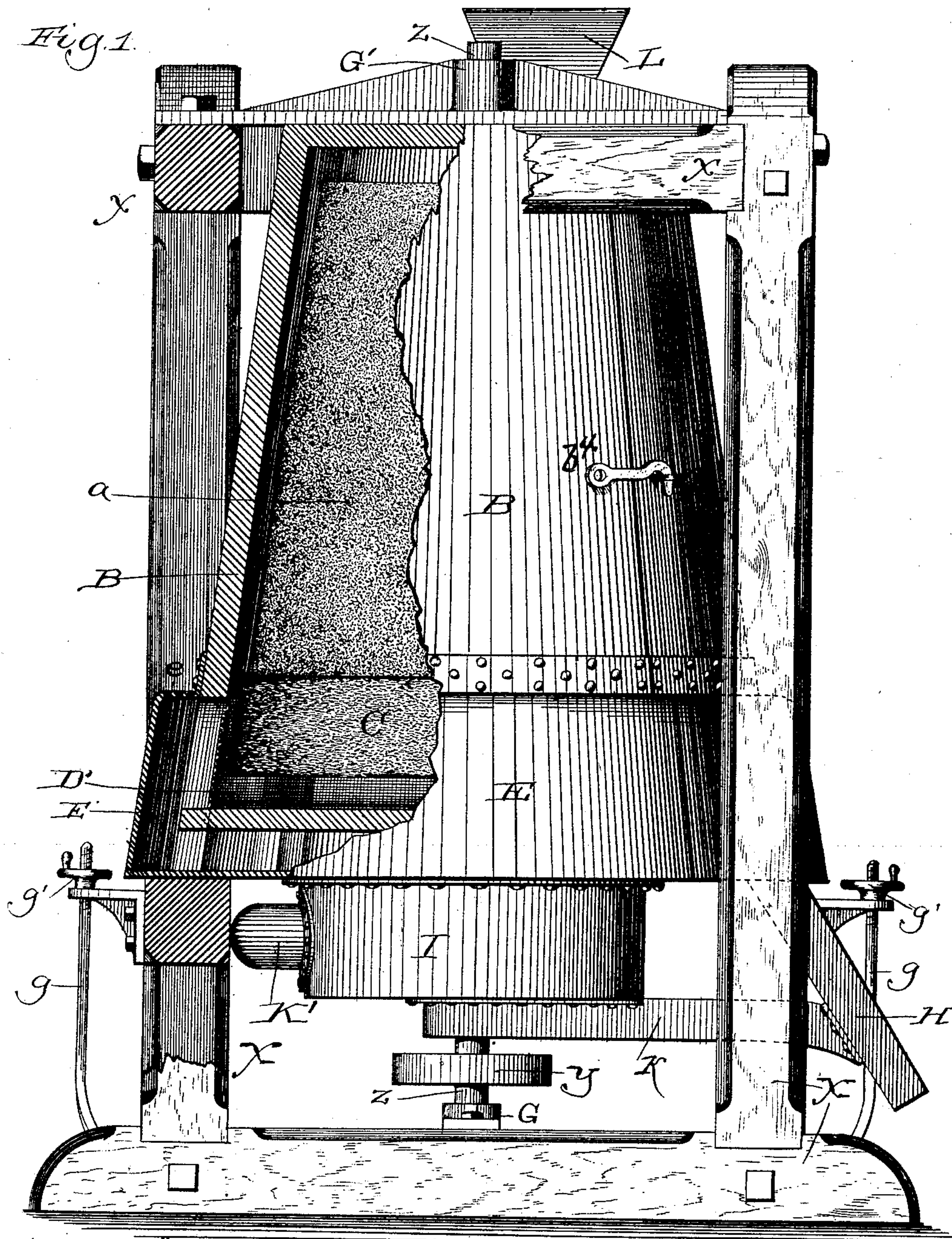
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M. CRAWFORD.

GRAIN CLEANING AND SCOURING MACHINE.

No. 348,826.

Patented Sept. 7, 1886.



Witnesses:
Chas. E. Gaylord
Flora L. Brown.

Inventor:
Middletown Crawford.
By Charles T. Brown.
Attorney

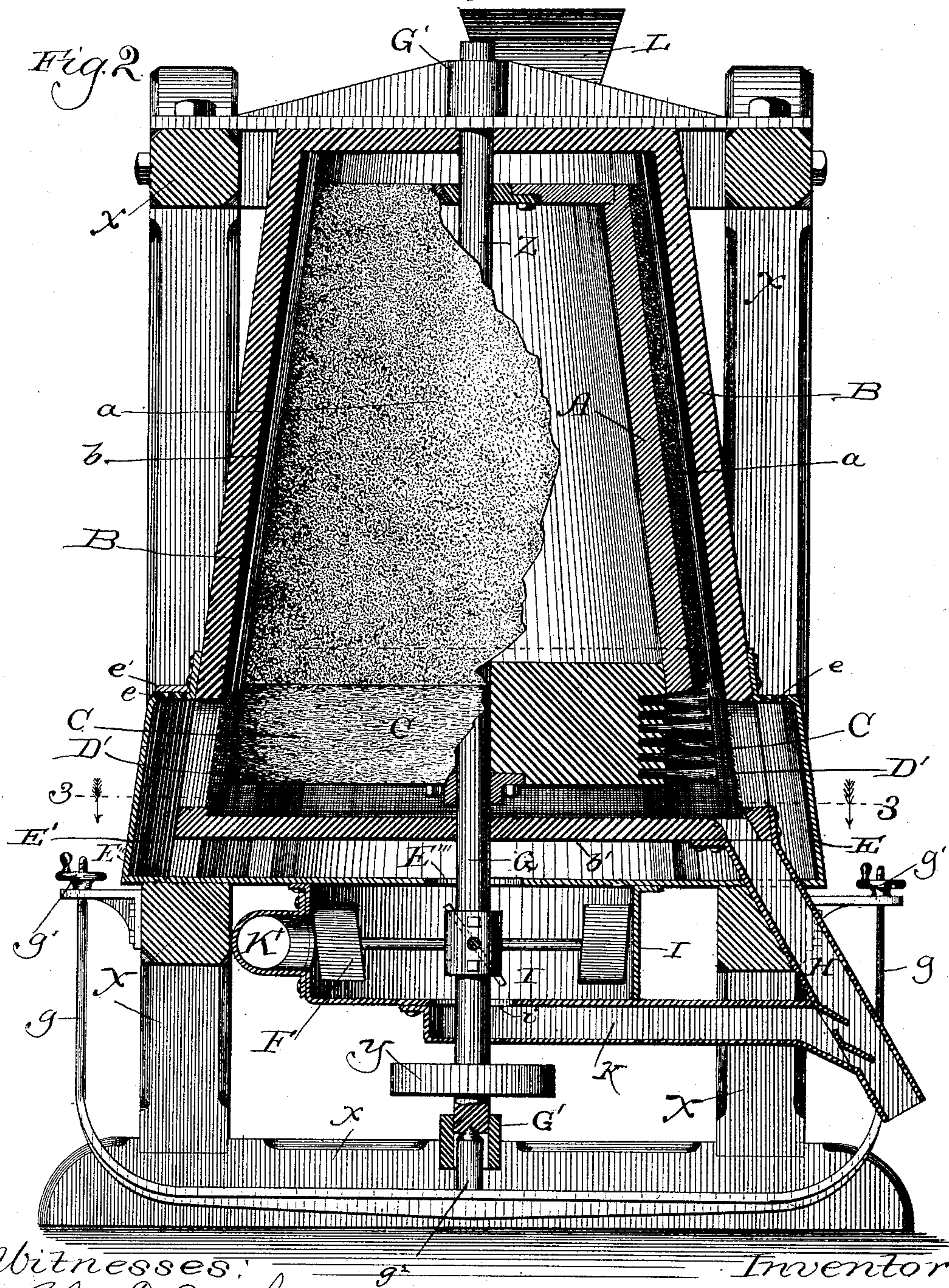
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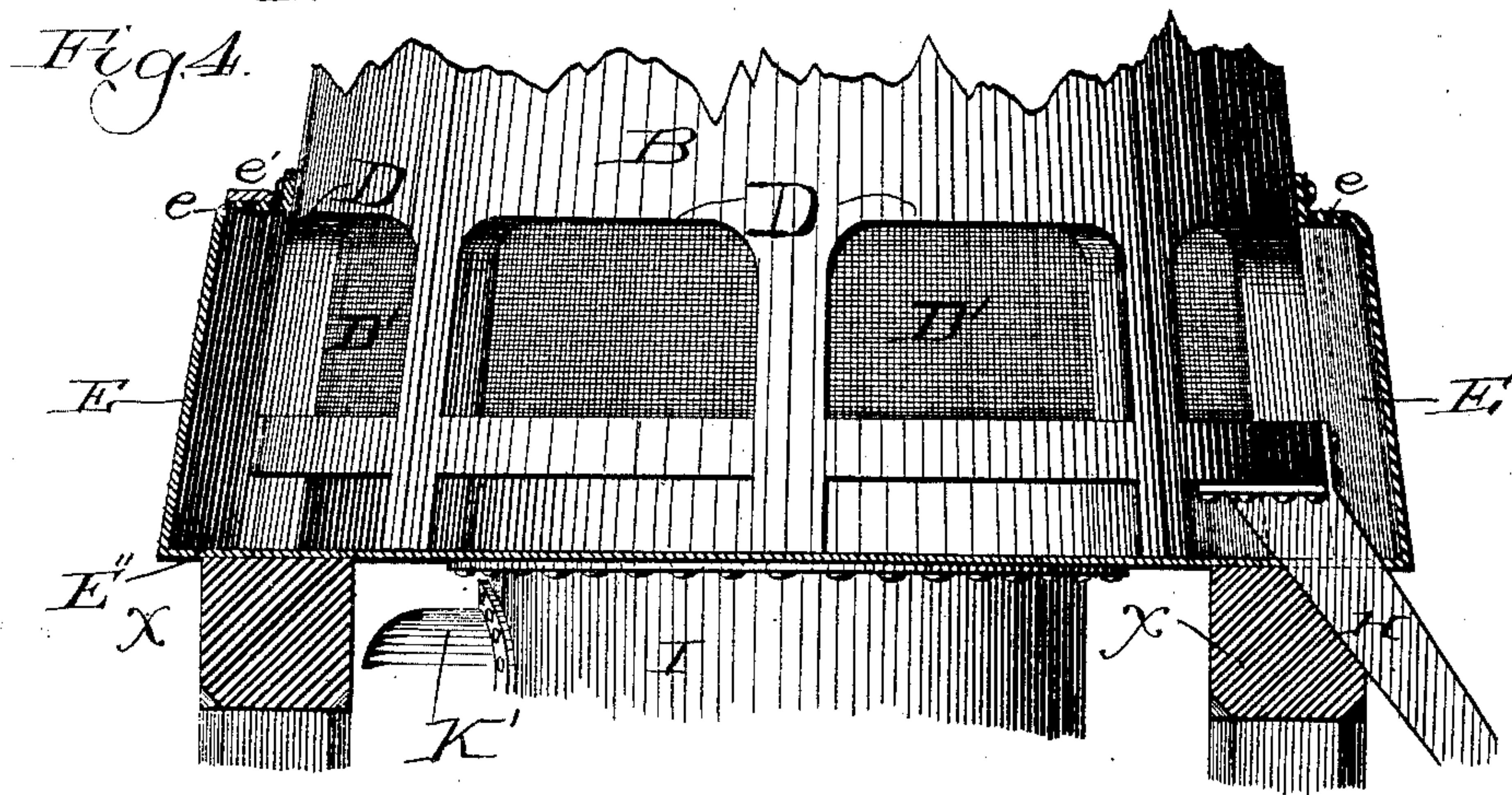
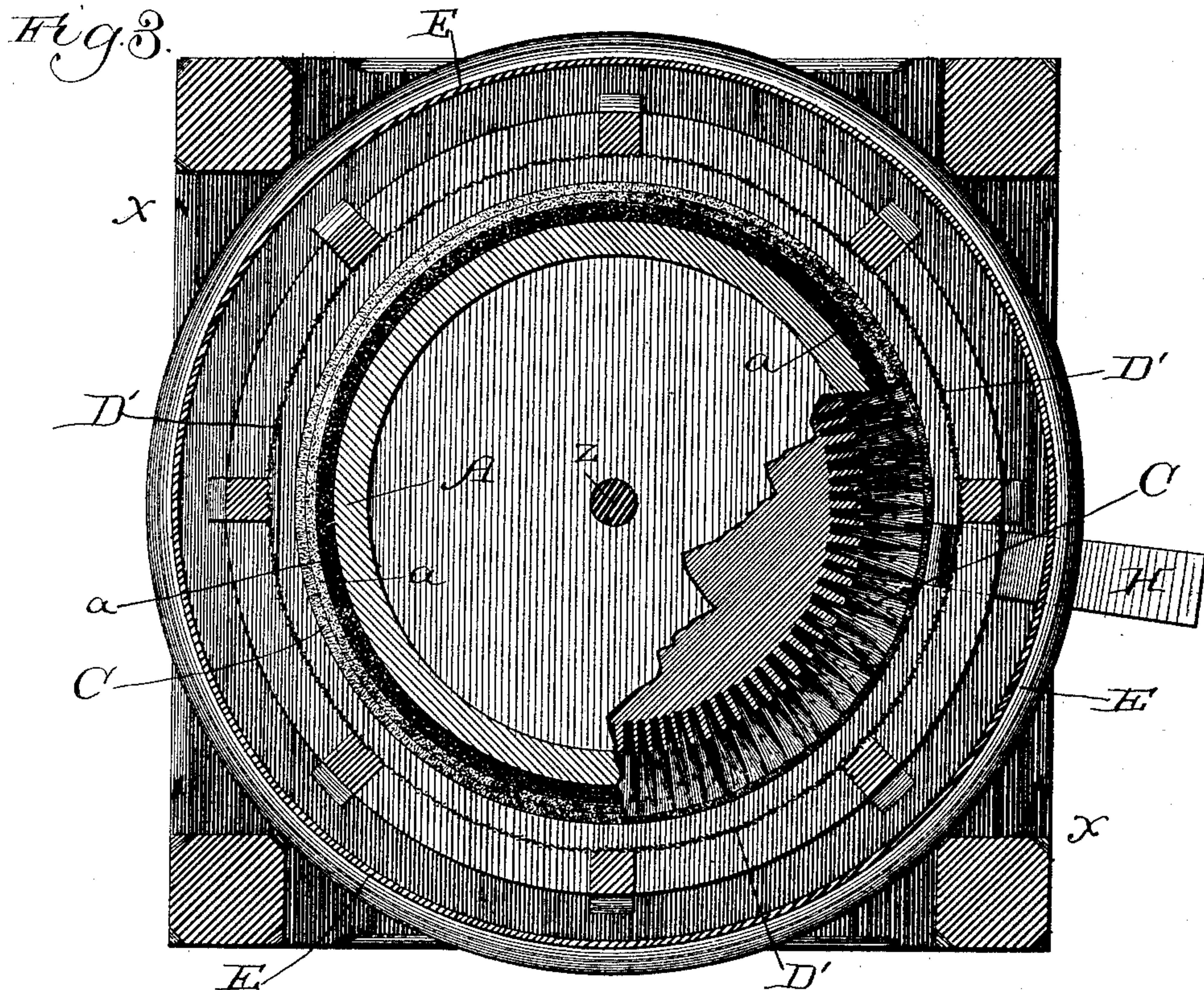
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UNITED STATES PATENT OFFICE.

MIDDLETON CRAWFORD, OF CHICAGO, ILLINOIS, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, OF ONE-HALF TO HENRY M. COLLYER, OF NEW YORK, N. Y.

GRAIN CLEANING AND SCOURING MACHINE.

SPECIFICATION forming part of Letters Patent No. 348,826, dated September 7, 1886.

Application filed October 23, 1884. Serial No. 146,669. (No model.)

To all whom it may concern:

Be it known that I, MIDDLETON CRAWFORD, a citizen of Canada, and a subject of the Queen of Great Britain, now and for one year last past residing in Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Grain Cleaning and Scouring Machines, of which the following is a specification.

The invention relates to machines for cleaning grain, and the novelty consists in the construction, arrangement, and adaptation of parts, as will be more fully hereinafter set forth, and specifically pointed out in the claims.

Ordinarily the cleaning of grain has been accomplished by moving arms or beaters, which strike the berries while they are in suspension among them or plow through the grain in mass. In some instances, also, the grain has been scoured between stationary and moving surfaces. In either case the contact of the berries with each other, or with the arms or beaters, or with the scouring-surface results in breaking many of the berries and rupturing the shell of others, occasioning the loss of particles of flour and rendering the subsequent separation of the bran difficult. Such are the means now employed to separate from the berries the natural fuzz which is upon one end of the berry and the friable germ-covering upon the other. These mechanical impurities are present in wheat and some other grains, and it is especially desirable to remove them before grinding, as their subsequent separation from the flour is almost impossible, the particles becoming almost as fine as the flour itself.

This invention is largely based upon the theory that the fuzz upon the end of the berry, and which is composed chiefly of silica, having a hardness of seven, according to Mohr's scale, known to all mineralogists, will not be completely separated by blows of beaters, contact of the berries with each other, or with a scouring-surface by the machines now employed. These at best only operate at intervals. Under such treatment it will bend, but not always break.

My invention provides for grinding the fuzz off entirely down to the hull on each berry. I provide a revolving truncated cone having

an even surface of fine sharp cutting material—as emery or other equivalent material, as corundum. This has a hardness of nine, (Mohr's scale,) and by its swift even motion rapidly and efficiently accomplishes its purpose. Concentric to and corresponding with this grinding-surface is an enlarged softer yielding surface, preferably of rubber, and between these two surfaces, which are continuous annularly, I allow the grain to pass in a downward spiral direction. The space between them may be adjusted to allow the grain to pass in such a thin sheet that contact between adjacent berries will not usually occur. This softer yielding surface serves efficiently to rub and clean off the loose bran covering the shell of the berries proper; but its more important functions lie in retarding the progress of the berry. It holds each end of the berry while its opposite end is acted upon by the grinding-surface, and the ends of the berries are compelled by this means to be alternately presented thereto in their downward spiral course. I provide that each berry shall be continuously treated by these two surfaces until all its smut, fuzz, &c., shall have been loosened, and for separating the said loosened substances from the body of the grain as soon as it emerges from the cleaning-chamber by a draft of air incited by the fan of the machine. At this point I submit the grain to a further brushing and scouring process, to remove such of the loosened substances mentioned as still adhere by means of brushes suitably arranged and forming a continuation of the cone above mentioned. I locate the fan directly under the scouring-chamber, and so arrange the parts that the draft incited by the fan will first take from the grain the great body of the impurities through suitable exits provided in the jacket, and while it is undergoing the brushing operation, and I afterward take any remaining impurities from the grain as it is being conducted from the machine. The first-mentioned impurities are gathered from the entire circumference of the machine and enter the fan-chamber from its top, while the latter are taken from the grain-exit and enter the fan-chamber from below, the impurities being forced in one direction, while the cleaned

grain gravitates in another. The grain is thus cleaned and scoured in one machine. These and other minor features of importance are combined in the construction and arrangement illustrated in the accompanying drawings, which form a part of this specification, and in which—

Figure 1 is an elevation of my invention broken away to show the internal construction, a portion being in section. Fig. 2 is a central vertical longitudinal section, portions being shown in elevation. Fig. 3 is a horizontal section taken on the line 3 3 of Fig. 2 and looking vertically downward. Fig. 4 is a detail view of the interior of the jacket near the bottom.

Referring to the drawings, *x* designates the main frame of the machine, which consists, essentially, of uprights and cross-beams, and may be of any suitable and approved construction. It supports a hopper, *L*, which is arranged to feed into the machine at a point near the center, and affords vertical journals for a revolving shaft, *G*, which will be described.

B designates a conical jacket having an interior soft lining, *b*, of rubber, or such analogous material or composition as will have a constant inherent spring-force to reassume a normal position. This jacket is rigidly supported in the main frame, and is concentric with the shaft *G*. Near its bottom *b'* in its circumference are formed a series of apertures, *D*, covered with wire screens *D'*, which are arranged flush with the inner surface of the jacket. The apertures *D* connect with an annular dust-chamber, *E'*, which is formed by a casing of sheet metal or other proper material, as seen at *E*, and this casing extends beyond the plane of the jacket and considerably below the horizontal plane of its bottom. The horizontal ledge thus formed between the jacket *B* and casing *E* is perforated at *e*, and the space between the bottom *b'* of the jacket and the bottom *E''* of the casing affords a channel for a draft of air from the annular series of perforations *e* to the top of the fan-chamber *I*, the bottom *E''* of the casing being open at *E'''* around the shaft *G*. The fan-chamber *I*, or, in other words, the casing *I*, which forms the fan-chamber, is arranged beneath the scouring-chamber, and is concentric with the jacket, the fan *F* being rigidly hung upon the main shaft *G*. A grain-exit chute, *H*, leads from the interior of the cleaning-chamber above the floor *b'*, as shown, and a chute, *K*, leads from the chute *H* to an opening, *i*, in the lower face of the fan-case. This chute *K* then and the passage mentioned from the annular dust-chamber are the sources of draft for the fan. It has a single exit-chute, *K'*, through which the dust and impurities separated from the grain are carried to a point remote from the grain-exit. The shaft *G* has a pulley, *Y*, through which it is connected with a source of power, (not shown,) and its lower end is seated upon an adjustable step,

*g*². This step is supported by a rod, *g*, which passes through a proper recess formed in the base of the frame *X*, and by suitable nuts, as *g'*, the step may be raised or lowered at will. This adjustment of the step *g*², and, consequently, of the main shaft *G*, is important in its relation to the operating-cone *A*, which is rigid with the shaft, and occupies a position within the cleaning-chamber. This cone in general contour corresponds with the cavity or interior of the jacket. That part of it which lies opposite the rubber of the jacket, and which may be termed its "operating-surface," is a continuous smooth sharp cutting-surface of emery. The lower portion of the cone, which in operation lies opposite to the screen *D*, is provided with a continuous brushing-surface, as *C*. Such brushes in connection with wire-screens have been heretofore used. The jacket may be made in sections secured by any suitable means, as *b''*. The hopper may be controlled by any suitable valve which will allow the feed to be properly adjusted.

The foregoing description, taken in connection with the drawings, will be sufficient to set forth the general construction of the machine; but in this art important consequences result from apparently unimportant changes and modifications. In the machine presented I embody several elements which will probably be best understood if given in their relation to the operation of the machine. Motion having been imparted to the shaft and cone and fan, and a proper "feed" of grain having been made, the grain enters the machine near the center of the top of the cone, and as it becomes affected by the motion of the cone it is uniformly spread out into a thin sheet, and thus falls into the space between the cone and the jacket. As it begins its downward course it strikes the revolving surface of the cone, is repelled, strikes the lining of the jacket, and is again thrown back against the cone. Thus each end of the berry is successively treated until the fuzz and impurities are thoroughly removed. The action of the fan in the meantime has created a partial vacuum in this space, and the light fuzz, &c., is carried down with the grain. As soon as the grain passes below the rubber *b* the brushes *C* act upon it, and the fuzz, &c., which by this time is converted into dust, is drawn through the screens *D'*. The holes *e* are of such size that there will be a partial vacuum in the dust-chamber *E'* when the machine is in motion. The grain is brushed against the screens and finally falls to the floor *b'*, whence it is delivered by means of the chute *H*, while the greater portion of the dust, &c., is drawn around under the floor *b'* and into the fan-chamber. If any of the dust, however, falls into the grain-chute *H* with the grain, the action of the fan through the chute *K* creates a counter-draft in the lower portion of the chute and carries it to the fan-chamber, whence it is all carried off through the blow-chute *K'*.

I attach importance to the rubber-lined

jacket in its relation to the emery cone. The cone is without rib or corrugation, and the rubber lining presents a continuous and approximately smooth face. All points of the cone and lining which are radially opposite each other are of a uniform distance apart, and no variation in the treatment of the grain occurs during its passage through the space between the cone and the elastic lining. The concavity of said lining being toward the grain each berry as its end is pressed into such lining not only receives the benefit of the elasticity of the lining in throwing the berry back upon the cone, but of its concavity in retarding its motion.

I attach importance to the location of the fan and to the dust-chamber, as shown. The holes or perforations are controlled by any suitable valves, *e'*, to adjust the draft.

In details of construction modifications may be made without departing from the principle or sacrificing the advantages of my invention, the essential features of which will be readily understood.

What I claim as new is—

1. In a grain-cleaner, the combination of a revolving cone having an exterior grinding-surface, as of emery, with a concave jacket concentric to and equidistant from said cone, having a continuous approximately smooth soft elastic lining, as of rubber, and means for feeding grain to the top center of said cone, whereby the same will be delivered in a thin sheet and continued between the concentric equidistant surfaces in a downward direction, the said surfaces being so adjusted relative to each other that the ends of each berry in its downward path are successively presented to the action of the conical and concave surfaces.

2. In a grain scouring and cleaning machine of the class described, the combination of a revolving cone having an emery surface with a jacket having a lining of rubber which presents a smooth elastic inner surface continuously concentric to the cone, and arranged to allow the grain to be forced through the space between the cone and the lining, and to receive the effect of the combined elasticity and concavity of the lining and the grinding effect of the emery as the cone is revolved, as set forth.

3. In a grain-cleaning machine, substantially as described, the combination of the jacket having a rubber lining and openings, as D, covered by wire screens, as D', with the revolving cone having an emery surface to correspond with the lining and brushes, as C, to correspond with the screens, as set forth.

4. The jacket B, having a scouring-surface above and screens D' below, and having a casing, E, to form a dust-chamber exterior to said screens, combined with a revolving cone

having a grinding-surface above and a brush-surface which lies opposite the screens, and a fan-chamber connected with said dust-chamber, the latter being provided with means, as *e*, for admitting air thereto, and valves *e'*, for controlling and adjusting said air-inlets at will, as set forth.

5. The jacket having grain-chute H and screens D', combined with the cone, the dust-chamber having controlled air-inlet, the fan, the chute K, and fan-discharge chute K', arranged and operating as and for the purposes specified.

6. In a grain-cleaner, the combination of a cone having a cutting-surface in the upper portion thereof and a brushing-surface below, a surrounding jacket having an inner elastic surface corresponding to the grinding or cutting part of the cone, and perforations in the lower part corresponding to the brushing portion of the cone, a secondary jacket forming with the first-named jacket an air-chamber, a delivery-spout for the grain, and an air-fan hung on the same vertical shaft as the cone and connected with said air-chamber, as and for the purposes set forth.

7. In a grain-cleaner, the combination, with a revolving cone having a cutting or grinding surface in the upper part thereof and a brushing-surface below, a surrounding jacket having an elastic rubber lining opposite the grinding-surface of the cone and perforations opposite the brushing-surface thereof, a secondary jacket having adjustably-covered holes therein in surrounding holes in the first-named jacket and forming an air-chamber, and the fan and chamber, as described, and for the purpose set forth.

8. In a grain-cleaner, the combination, with the cone having grinding and polishing surfaces, and with the jacket having elastic lining and perforations arranged, as described, of a feed spout or hopper placed above and near the center of said cone, a fan placed beneath said cone, a fan-chamber, a secondary jacket forming an air-chamber connected with the fan-chamber and having controlled air-ducts therein, a delivery-spout for the grain, and conduits connecting the said delivery-spout, air-chamber, and fan, substantially as and for the purposes specified.

9. In a grain-cleaner, the combination of cone A, jacket B, brush C, wire-netting D', jacket E, fan F, shaft G, delivery-spout H, jacket I, spout K, conduit K', and spout L, all substantially as described, and for the purposes set forth.

MIDDLETON CRAWFORD.

Witnesses:

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